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Citation for published version:

Martindale, A, Collins, D & Morton, V 2017, Cognition at the crime scene: Identifying cognitive demands on professional judgment and decision making expertise of crime scene examiners. in J Gore & P Ward (eds), *NDM13 Naturalistic Decision Making and Uncertainty: Proceedings of the 13th Bi-annual International Conference on Naturalistic Decision Making*. The University of Bath, pp. 226-230, 13th International Naturalistic Decision Making Conference, Bath, 20/06/17.
<<https://web.archive.org/web/20200128153508/https://www.bath.ac.uk/publications/naturalistic-decision-making-and-uncertainty/>>

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

NDM13 Naturalistic Decision Making and Uncertainty

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Cognition at the Crime Scene: Identifying Cognitive Demands on Professional Judgement & Decision Making Expertise of Crime Scene Examiners

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ABSTRACT

This research highlights the importance of professional judgement and decision making expertise within a skilled Scene Examination workforce. The use of Applied Cognitive Task Analysis allowed for illumination and provision of feedback on the thought processes of experienced Scene Examiners, including detailed observable information about actions taken, situation assessment, and use of critical cues. This information carries a range of operational uses, and can be a valuable addition to existing training. Implicit findings indicated the potential to move training towards a more adaptive expertise base, with consequent gains for the quality of service, and a more flexible and adaptable workforce.

KEYWORDS

Decision Making; Crime scene examination; Accessing expert cognition; Cognitive demands.

INTRODUCTION

Scene Examiners (SEs) meticulously search the crime scene, recording and recovering forensic evidence, which can ultimately be used to prove or disprove if a crime has occurred. These stressful field conditions are characteristic of the high stakes which typify naturalistic environments including ill-defined and competing goals, conditions of uncertainty, and time pressured decision making (Ross, Shafer & Klein, 2006).

Given the inherent complexities of crime scenes, and the huge amount of visual information available, the professional judgment and decision making (PJDM) expertise of SEs is of the utmost importance to the successful delivery of this service. From an organisational and business perspective, international standards for professional judgement have recently been established with governing bodies considering how they can demonstrate that they meet these standards through accreditation criteria (e.g., ISO/IEC17020). Although professional judgement is widely recognised as a necessary and intrinsic part of daily scene examination activity (and indeed of practice across many professions) it is surprisingly difficult to define and operationalize. We suggest that PJDM offers insight into how practitioners 'think' in action. Service delivery is a series of judgments and decisions and SEs are required to process vast amounts of information, to be able to think on micro and macro levels (often at the same time) and to rapidly formulate and enact coherent plans of action (Martindale & Collins, 2012).

The development of PJDM expertise has been studied in several high performance domains (e.g., psychological support, elite sport and coaching; Martindale & Collins, 2013) and is readily applicable to parallel domains of human performance. Indeed, as SEs develop this expertise, so their cognitive development, knowledge structures, and reasoning processes become more sophisticated and enhanced (Hoffman, 1996). Yet, these processes are by their very nature 'covert' - making them very difficult to 'see' and therefore to understand and train in novice and developing practitioners.

This work investigating PJDM expertise in Scene Examination attempted to 'make thinking visible' by accessing and capturing the thought processes of experienced SEs, identify the cognitive demands on PJDM, provide individual feedback to SEs involved in this work, and to develop a simulation scenario based training tool as a means of accessing and documenting expert knowledge. We were also interested to gain the SE's perspectives of the benefits and limitations of using the Applied Cognitive Task Analysis methodology.

METHOD

Participants

Following institutional ethical approval and informed consent, 6 Scene Examiners were recruited (2 male and 4 female). This exceeded the recommendation of 3 – 5 participants by Militello and Hutton (1998). Participants were

recruited across three regional areas (2 from each area). All participants were deemed competent and monitored by their National Governing Body. Participants had worked in the field for an average of 18 years (range 6-32 yrs). Participants interviewed were either experienced Scene Examiners (3) or Scene Examination Supervisors (3) and were selected by the National Governing Body senior management on the basis of their experience and expertise (e.g., Militello & Hutton, 1998). In addition to their Scene Examination role, participants also had experience in a range of other roles including: fingerprint officer/expert, footwear & tool impression comparison, ballistic examiner, photography assistant, and medical photographer.

Materials

Cognitive Task Analysis (CTA) techniques have been shown to produce greater amounts and qualitatively more meaningful data than observations of the task or self-generated explanations of the task (Tofel-Grehl & Feldon, 2013). This work involved the use of Applied Cognitive Task Analysis (ACTA, Militello & Hutton, 1998) to understand the cognitive task demands on PJDM of SEs, and to identify the key cognitive elements required to perform proficiently. This meta-method comprises of three techniques: task diagram, knowledge audit, and simulation scenario (crime scene examination response to a complex and major incident) which complement each other, but which also tap into different elements of cognitive skill (McAndrew & Gore, 2013). The method therefore offers a unique window on the thought processes and PJDM expertise of Scene Examiners, and transforms covert thinking into detailed observable information about actions taken, situation assessment, and the use of critical cues. Previous findings have indicated high levels of validity and reliability with modal statistics occurring in the range of 90% to 95% (See Militello & Hutton, 1998, for a full description of each ACTA method).

Procedure

Each interview took approx. 3 hours and was conducted on site at a time and location that was operationally viable. Throughout the interview process the researcher made detailed notes following the outlines provided on the ACTA Job Aid cards (ARA Inc, 2005). The interviews were recorded on a digital voice recorder and transcribed verbatim. Audio recordings of the interviews were utilized afterwards to ensure the completeness and accuracy of the data. The provision of individual feedback to SEs involved the presentation, read-through, and verification of each stage of the ACTA protocol as well as the resulting Cognitive Demands Table. In particular, SEs were asked about the ‘completeness’ and ‘accuracy’ of the information at each stage and were actively encouraged to highlight anything which was missing or incorrect. Following the provision of feedback and data verification process, SEs were asked to report on the perceived benefits and limitations of accessing expert cognition in this way. Raw data quotations were qualitatively analysed using inductive analysis to build up a series of lower order and higher order themes.

RESULTS

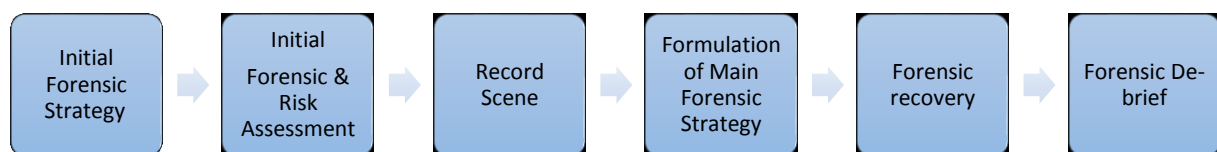
Due to the richness and depth of the qualitative data collected, illustrative examples will be used to outline the results from the task diagram and knowledge audit stages. Due to the restricted nature of the data, an overview of the broad themes from the Cognitive Demands Table will summarise the findings. These findings are used to illustrate the cognitive demands on professional judgment and decision making expertise in Scene Examination.

Illustrative example: Scene Examination Supervisor (32 years experience)

Stage 1: Task Diagram

The task diagram for Scene Examination Supervisor A focuses on the strategy for forensic recovery at a crime scene (see Figure 1). The first stage involves the formation of an initial forensic strategy which includes gaining background information, and establishing health and safety issues. The second stage is the initial forensic assessment in which the SE attends the scene with others and undertakes an initial forensic and risk assessment of the situation. The third stage is to record the scene as is (e.g., briefing and instructing the SE team to video the entire scene). The fourth stage involves the formulation of the main forensic strategy, and the fifth is the forensic recovery of evidence itself. The sixth and final stage is a forensic de-brief with the SE team. Scene Examiner A identified the forensic recovery stage as the most cognitively demanding stage within the overall task.

Figure 1. Exemplar Task Diagram for Scene Examination forensic recovery



Stage 2: Knowledge audit

Table 1 provides an extract from Scene Examination Supervisor A’s knowledge audit. The example included in this table is discussed in more detail below.

Table 1. Exemplar Opportunities/Improvising from Knowledge Audit

Cognitive Element of Expertise	Cues & Strategies	Why Difficult? (for someone less experienced)
Opportunities/Improvising		
Experts are comfortable improvising – seeing what will work in this particular situation; they are able to shift directions to take advantages of opportunities.	<ul style="list-style-type: none"> • Prioritise forensic opportunities (fibres, shoe impressions, pieces of door, blood) • Resist ‘quick fix’ frame of mind due to time pressure to catch up • Resist temptation to bypass certain aspects to get to aspects that would yield quicker results (fingerprints as quick fix, but destructive process) 	<ul style="list-style-type: none"> • May be tempted to go for the ‘quick fix’ to catch up – potentially compromising the scene
<i>Can you think of an example where you have improvised in this task or noticed an opportunity to do something better?</i>	<ul style="list-style-type: none"> • Conscious decision to operate in a structured manner • Sense making/ story building/ running mental simulations • Ensure compromises are not to the detriment of the forensic recovery • Where compromise is necessary (e.g., major road) weigh up consequences/ implications 	<ul style="list-style-type: none"> • Where there are ways to cut a corner or improvise they may not resist in order to do the job properly

Opportunities/Improvising

Scene Examiners were asked to provide an example of where they have improvised in the task of forensic recovery or noticed an opportunity to do something better. In terms of cues and strategies, scene examiners may look to prioritize forensic opportunities (e.g., fibres, shoe impressions, and blood) whilst resisting the ‘quick fix’ temptation to bypass certain aspects of the recovery to get to aspects that would yield quicker results. For example, fingerprints may yield a ‘quick fix’ opportunity, but the collection of prints is a destructive process to other potential forensic material. The conscious decision to operate in a structured manner allows for the opportunity to make sense of the situation, build a bigger picture of the crime scene, and ensure that compromises are not to the detriment of the forensic recovery. This may be difficult for someone less experienced, as a novice is more likely to go for the ‘quick fix’, especially if under time pressure.

Cognitive Demands

A cognitive demands table was compiled to consolidate and synthesize the data from the six Scene Examiners. Further cognitive demands tables were compiled to represent responses from SE’s in each of the three regions. These tables contained information on the difficult cognitive elements of the job, why this would be difficult for someone less experienced, the potential errors someone less experienced may make, and the cues and strategies that more experienced personnel may rely on. Overall, four broad areas of scene examination (formulation of initial forensic strategy, initial forensic assessment, formulation of main forensic strategy, and forensic recovery) revealed between 26 and 31 cognitive demands, across regions. Forensic recovery as the central task revealed between 8 and 12 cognitive demands. These findings highlighted potentially important regional differences in the effectiveness of the approach to the examination of a scene by SEs.

Perceived Benefits & Limitations

Participants reported a number of perceived benefits and limitations to the use of the ACTA method for accessing SE cognition in this way. Benefits included the effectiveness of ACTA in generating useful information (e.g., encourages reflection, useful addition to SOPs, concise description of the job), potential uses for information generated using ACTA (e.g., initial and ongoing training tool, provision/exchange of vicarious knowledge, useful to explain scene examination to new police officers, useful in developing a National model for major incidents) and as a valuable addition to existing training (e.g., more concise way of reflecting on/progressing through scenarios of increasing difficulty). Limitations included difficulties with knowledge elicitation (e.g., difficulty generating examples ‘on the spot’, uncertainty over whether responses were appropriate, inherent time constraints on explaining all aspects of the job), the combination of volume and serious crime (e.g., different strategic approaches to volume and serious crime), and the realism/scope of scenarios (e.g., second-guessing in simulation scenario what others have already done, wouldn’t be assessing cold – would have much more information).

DISCUSSION

Accessing and documenting the cognitive demands on PJDM in SEs illuminates the cognitive processes of these skilled professionals. This information feeds directly into the necessary training systems and structures required to develop and accelerate expertise in Scene Examination. This research shows that using a naturalistic approach to investigating PJDM expertise in Scene Examination can yield rich and detailed insights into the cognitive demands inherent in this complex task, and offer a unique window on ‘cognition at the crime scene’.

Implicit Findings and Interpretation

Several implicit findings emerged from the data in addition to the explicit and generally positive perceptions reported earlier. For example, the potential to move training towards a more adaptive expertise base, with consequent gains for the quality of service emerged as a consistent if implicit theme. The current culture within

Scene Examination appears to be overly geared towards ‘competent’ practice. This is characterised by the prevalence of SOPs as markers of ‘quality’ and the use of competency-based assessment in order for SEs to reach a baseline (competent) level of service provision. Some of the responses generated by participants reflect this culture (e.g., difficulty in ‘thinking on the spot’ and being ‘unsure’ if responses were ‘correct’) suggest that perceptions of ‘what is expected’ are procedurally based.

In contrast, further responses from participants in this study suggest some inherent drivers (indeed desire) for the Scene Examination culture to be expertise-based. This would be characterised by on-going training and development opportunities for SEs (largely embedded within practice rather than bolt-on ‘top-up’ courses), plus the development and enhancement of practice through a community of practice approach (Wegner, 2011). Professional learning systems and structures that would allow SEs to share experiences and explore the ‘shades of grey’ inherent in practice would relieve some of the competency-based constraints and make for a more flexible and adaptable workforce. Recent positive exemplars of this approach are apparent from a wide variety of professional domains, including nursing, military and elite refereeing (e.g., Collins et al., 2015).

Limitations

There are some important limitations to note, many of which were identified by the participants in reflecting on the process undertaken. Although this research follows other similar studies (e.g., McAndrew & Gore, 2013) in an attempt to capture ‘cognition in the wild’, the recall of past events/circumstances and the simulation of crime scene scenarios are not directly parallel to conducting scene examination in the real-time present. Of course, the logistics of this are complex, not least because of the difficulties with introducing researchers to crime scenes. Although ‘think aloud’ technology may go some way to overcoming some of the practical constraints on accessing expert cognition, the threat to compromising a crime scene would need to be firmly established and negated prior to any data collection at live crime scenes, as well as authorisation from the criminal justice system.

CONCLUSION

This study makes a unique contribution to the literature by outlining the cognitive demands on PJDM expertise in scene examination. These findings have been useful from an operational perspective (e.g., allocating staff to respective crime scenes) and in terms of developing training and ongoing professional learning systems and structures (e.g., in designing a scenario-based training tool for scene examination response to a complex and major incident). This data is also contributing to the development of a National proficiency scale for scene examination, which in turn has implications for policy, such as a National career grade framework for scene examination.

ACKNOWLEDGMENTS

The authors wish to thank the participants and senior management of the Scottish Police Authority Forensic Services for their time, willingness, and insight, and the Scottish Institute of Policing Research and the University of Edinburgh College of Arts Humanities and Social Sciences for funding this research.

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